10 MWe sCO2 Pilot Plant
Task 7A Cooling System
Installation Pre-Bid Meeting
May 14 2020

Brian Lariviere – GTI Project Program Manager
Doug Heim – GTI Cooling System Engineer
Tavin Dille – SCI Project Engineer
Phil Holland – GTI Contracts
Eric Thompson – SwRI Construction Manager
Can one spokesperson from each company identify your company so we know who is on the call?
Meeting Purpose and Agenda

PURPOSE: Review the Task 7A Cooling System Installation Bid Package, the STEP Project & Team and the Bidding Guidelines, Due Date and Answer any Questions on the Bid Package.

AGENDA: Review the key agenda items noted below.

1. Introductions (GTI: Doug Heim)
2. Project Background and Overview (GTI: Brian Lariviere)
3. Bidding Process Schedule (GTI: Doug Heim)
4. Bid Package Review of Content (SCI: Tavin Dille)
5. Brief Review of GTI Commercial Terms and Conditions (GTI: Phil Holland)
6. Review of Safety, Host Site Requirements, Site Walk Through Date, Other Contractors on Site, etc. (SwRI: Eric Thompson)
7. Review of Cooling System Scope of Supply / Details (Doug Heim)
8. Potential Bidders Questions (ALL)
9. Follow-Up Actions (ALL)
Introductions – Project Related Information

COMPANIES:
• Gas Technology Institute (GTI) – Prime Contractor with DOE
• Southwest Research Institute (SwRI) – Subcontractor to GTI - Host Site
• General Electric Global Research (GE-GR) – Subcontractor to GTI – Turbomachinery
• Stanley Consultants Inc. (SCI) – Site Engineering Contractor
• TAS – STEP Cooling System Equipment Manufacturer

CONTACTS:
• Brian Lariviere – GTI Project Program Manager
• Aaron McClung – SwRI Program Manager
• Jason Mortzheim – GE-GR Program Manager
• Mark Payne – SCI Project Manager
• Eric Thompson – SwRI Construction Manager
• Doug Heim – GTI Cooling System Engineer
• Tavin Dille – SCI Project Engineer
• Scott Macadam – GTI Plant Engineer
• Francis Musa – TAS Product Manager
Introductions – Project Related Information

INVITED BIDDERS:
• How was the bidders list developed?
  ➢ GTI reached out to SwRI, SCI and TAS for contacts capable of installing equipment and did some web searches.
  ➢ GTI contacted the various contacts and discussed the general scope of the project to determine interest.
  ➢ GTI reviewed company websites and information provided from prospective bidders and came up with the bidders invited to this pre-bid meeting.

BID PACKAGE CONTENTS
• The bid package consists of the files in email link sent directly to each bidder from SCI.
• The list of files is shown on the next slide and SCI will walk through the key items within this package as part of this meeting.
Introductions – Project Related Information

INFORMATION SENT IN THE BID PACKAGE IS SHOWN BELOW:

<table>
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<tr>
<th>Citrix Attachments</th>
<th>Expires June 11, 2020</th>
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<tr>
<td>27772-SCI-0375 - Task 7A Project Manual &amp; Design Drawing...</td>
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<tr>
<td>26 06 04 Conduit Schedule.xlsx</td>
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Download Attachments

Sarah Tomase uses Citrix Files to share documents securely. Learn more.
Introductions – Project Related Information

CONSTRUCTION PACKAGES & TASK PLANNERS:
• Task 6: Building, Foundations, UG Raceway, Bldg. Electrical - Eric Thompson/Craig Nolen
• Task 7A: Cooling Tower System – GTI: Doug Heim
• Task 7B: Process Heater – GTI: Mark Stevens
• Task 8E: Process Electrical – SwRI: Craig Nolen
• Task 8M: Process Mechanical – SwRI: Jonathan Wade

OTHER CONTACTS
• SwRI Warehouse Manager: Al Steiner
• Project Control/Schedule: Katie McCloud (SwRI)
• GTI Document Control: Michelle Poughassamians
• SwRI Document Control: Andrea Barnett

KEY THEME: Complete all work safely!
Introductions – Project Related Information

OVERALL SITE MAP / PICTURES

Heat Exchanger Skid

Electrical Equipment

Cooling Towers

Chemical Shed

West Side of Building – March 2020

East Side of Building – March 2020
Supercritical Transformational Electric Power (STEP)
10 MW_e sCO2 Pilot Plant Demo
Heater Installation - Bidders Conference

Date Held: April 15, 2020
**Supercritical Transformational Electric Power (STEP) Project DE-FE0028979**

**Scope:** Design, construct, commission, and operate a 10 MWe sCO₂ Pilot Plant Test Facility - reconfigurable to accommodate other testing – **First of a kind at this scale**

**Goal:** Advance state of the art for high temperature sCO₂ power cycle performance from Proof of Concept (TRL3) to System Prototype validated in an operational system (TRL7)

**Team:** U.S. Department of Energy (DOE NETL)  
Gas Technology Institute (GTI®)  
Southwest Research Institute (SwRI®)  
General Electric Global Research (GE-GR)  

**Joint Industrial Partners:**

**Schedule:** Three budget phases over six years (2016-2022)
Promise of sCO$_2$ Power Cycles

Promise:
> Efficient, Compact, Scalable, low water, low-carbon power generation

Plans to Demonstrate:
> Operability, Turbomachinery, Seals, Heat Exchangers, Durability, Materials, Corrosion, Cost

Versatile Technology – Broad Applicability:

- Concentrated Solar
- Fossil Fuel
- Geothermal
- Nuclear
- Ship-board Propulsion
- Waste Heat Recovery
STEP Program Objectives

STEP Demo will demonstrate a fully integrated functional electricity generating power plant using transformational sCO2-based power cycle technology

Demonstrate pathway to high efficiency

Demonstrate cycle operability at 10 MWe net power generation

Quantify performance benefits:
  - Reduced emissions, fuel, and water usage

Demonstrate Reconfigurable flexible test facility

Beyond STEP - sCO2 Technology Test Bed Available
  - Available for Testing future sCO2 equipment & systems

STEP will be among the largest demonstration facilities for sCO2 technology in the world
STEP - Flexible Test Facility

Test Bay for Process Hardware

Control Rooms, Offices, & Assembly Areas

Includes Area for Expansion

Process Heater

Inventory Mgmt System

Process Cooling

Process Electrical
STEP Plan – Currently Mid-way through BP2

**Budget Period 1**
- Detailed Facility and Equipment Design
  - System analysis, P&IDs, Component Specs
  - Design major equipment
  - Procure heat source, cooling tower & long-lead items
  - Materials & seal tests
  - Start site construction

**Budget Period 2**
- Fabrication and Construction
  - Complete site construction and civil works
  - Fabricate & Install Major Equipment
  - Commissioning & Simple-Cycle Tests

**Budget Period 3**
- Facility Operation and Testing
  - Facility reconfiguration
  - Test Recompression Brayton Cycle
  - Validate Traceability to Performance Objectives

**Status:**
- BP1 Completed
  - System & Major Equipment Design
- BP2 Progress
  - Site Construction Nearing Completion
  - Heater and Cooling System first major equipment installations
  - Procurement & Fabrication of major equipment nearing completion
  - Delivery of Major Equipment started in Nov 2019
BP3: Recompression Closed Brayton Cycle

Objectives

Demonstrate high performance cycle with parallel compressors & multiple HEX
- Measure Steady & Transient Cycle Performance Data, evaluate operability
Bidding Process Schedule

The key dates associated with the Task 7A bid package are shown below:

- Issue Task 7A Cooling System Installation Bid Package: 5/12/20
- Conduct a Virtual Pre-Bid Meeting: 5/14/20
- Schedule a Site Walk Through For Interested Bidders: 5/21, 22, 28, 29
- Bids Due Date: 6/19/20
- Complete Bid Reviews, Clarifications, Analysis, Recommendation: 6/30/20
- Award the Task 7A Cooling System Installation Bid Package: 7/3/20
- Selected Contractor Mobilization Complete: 7/24/20
- Power Available for Task 7A Contractor for Final Checkout: 10/5/20
Bid Package Review of Content

SCI will walk through each of the documents below to highlight key items:

- GG101: General Site Plan
- Project Manual
- SCI Electrical Drawings
- SCI Structural Drawings
- SCI Mechanical Drawings
- Vendor Documents
Bid Package Review of Content

- Site Layout PDF Page 67
  - Foundations are poured including anchor bolts for cooling tower
  - UG Raceway is installed
  - No work associated with Chillers
  - Building will be complete by the time 7A starts
  - Task 8E work will be occurring simultaneously to this contract
  - Task 7B (Heater work will also be occurring)
- Milestone Schedule PDF Page 24
  - Power available on October 5th – Contractors to determine schedule that allows them to be able to finish by November 10th.
  - Note there is LD for substantial completion
Bid Package Review of Content

• Division of Responsibility (DOR)
  • You are Contractor Responsible for Task 7A – Installation of Cooling System
  • Item 53a on PDF Page 26
    • Cooling Tower Ladders and pads provided by 7A contractor (grade to first platform)
    • Item 374 and 374b on PDF page 40—First fill of cooling tower chemicals- must work with ChemAqua

• Exhibit 1-4 Adjustable Unit Prices PDF page 49 and Exhibit 1-5 Subcontractor Pricing PDF page 51
  • Please fill these out with bids
Bid Package Review of Content

- Bid Summary Sheet – Section 00 43 22 – PDF Page 64 -- Please break pricing in this manner.
- Provide Option Price for maintenance activities. GTI is working on a list of activities and will include as an Addendum.
- Include allowance for maintenance of construction entrance. Maintain access road in as found condition from W Commerce St to the jobsite.
- Include allowance for 3rd Party Inspections of Structural Steel. Refer to Section 05 10 00 05 55 00.
Bid Package Review of Content

- Section 01 11 00 Summary of Work –
  - PDF Page 68 - Plans submitted 30 days prior to mobilization
  - Safety plan needs to include lockout tagout
  - Provide Safety Statistics with Bid(PDF Page 69)

- Part 1.03 H (PDF Page 70)- TAS provides chem shed. Contractor builds it. Contractor provides unit heater and power feed. Contractor installs all other components shipped loose by TAS.
  - Eyewash station outside chem building – Handed over from SwRI to 7A contractor. 7A to install piping, eye wash station, and its heater.
  - Contractor to provide fire extinguisher at chem feed shed.

- Part 1.06 B (PDF Page 72)
  - Must move 3 tower cells, fans, motors, and miscellaneous shipped loosed items from somewhere on SwRI campus to site – within 1.5 miles of jobsite.
  - Very limited laydown space, must coordinate shipment of all other TAS equipment to site such that it can be hoisted off truck and set into place.

- Part. 1.03K (PDF Page 71) – Miscellaneous Electrical Items supplied by 7A
  - Cable Bus including support steel
  - Panelboard
  - Disconnect
  - Item c: must move feeder breaker in SWBD’s.

- Part 1.03L – Provide interconnecting wiring between Skids.
Bid Package Review of Content

- Electrical Lists –
  - Cable Schedule PDF Page 172
    - List is used by multiple contractors - highlights indicate new additions (For other’s reference)
    - Note Scope
  - Conduit Schedule for Reference Only PDF Page 174
  - Excel versions

- Section 40 80 00 Pre-Commissioning-PDF Page 203
  - Contractor responsible for pre-commissioning checkout, cleaning, blowing, megger tests, bumping motors, loop checks, etc.
  - Start up of system as a whole will be by SwRI.
  - 7A will be responsible for cleaning piping installed by Task 6 Contractor. Task 6 will perform their own flush and cover before turnover.
    - 7A Must provide jumpers inside the building to flush headers in building. Must coordinate with SwRI.
    - 7A to Provide flush pumps
  - Part 3.11 -- first fills by 7A (PDF Page 209)

- Mechanical Lists PDF Page 253 – 7A is highlighted Orange
Bid Package Review of Content

Electrical Drawings

- EG010/EG011 (PDF Pages 5 and 6) - Equipment List – Scopes
- EO003 (PDF Page 12) as an example - Scopes shown in boxes (7A)
- EP102 (PDF Page 19) – Install TAS Transformers and Switchboard. 7A to provide and install Cable bus and support steel. See SS145 and SS545.
  - Above ground conduit field routed by 7A
- EU Series Drawings (EU102 PDF Page 22 as an example) - UG Conduit for reference only – UG Raceway is installed. You will pull through existing UG raceway.
  - In general, from an electrical pulling and terminating perspective, the philosophy is that if you install the equipment, you pull and terminate the cable for it.
- No tray required by 7A contractor
Bid Package Review of Content

**Structural Dwgs**

- Structural
  - SG003 (PDF Page 3) Ladder Pads
  - SG014 (PDF Page 6) – Ladder from grade to Cooling Tower Platform
  - All foundations are poured
  - SF115 (PDF Page 8)
    - Cooling Tower Mounting bolts installed
    - For auxiliary equipment – 7A to provide epoxy anchors per SF115
  - SS145/545 – 7A to provide frame for cable bus (and bus too)
  - SS180 – Provide steel platforms (Qty 2)
  - SS581 – Type V Pipe Support Supplementary Steel by 7A
Bid Package Review of Content

Mechanical Drawings

• Pipe Supports
  • Section 20 05 29 - Pipe Supports (PDF page 139)
    • Table in Part 1.03
      • Contractor to use typical details and tables to select and locate components — must work with Anvil or equal for semi-engineered components.
  • MP 401A (PDF Page 16 of Mechanical Drawings) – Pipe Support Stands are installed now.
  • MS504 (PDF Page 23) – Selection of Rod Hangers for Large Bore pipe under tower
  • Contractor to provide supplementary steel, shims, and supports. (PDF Page 19- MP403)
  • Contractor 7A responsible for providing pipe support components
• Reference Drawings
  • MP40X Series Locate semi-engineered supports
  • Use Table 2 on MS001, and Standard MSS-SP 58 to select support components
  • Loads are shown on MS504. Work with Anvil or equal pipe support component vendor.
  • GU and RH details shown on MS501 and MS502.
  • Small bore pipe is field supported: use Table 1 on MS001 to locate supports
  • Refer to SS581 for supplementary steel.
• Cold CCCW needs to be insulated – none for rest of piping
  • MP 103 and MP104 (PDF pages 11 and 12) – for flushing only
• P&ID's
  • PI606, PDF Page 8 as an example- Scopes are defined
Bid Package Review of Content

- Equipment Erection (Vendor Documents)
  - TAS P&IDs – PDF Page 6 as an example (Install Shipped Loose Items, all off skid piping skids)
    - Must route conduit, provide and install wiring to field mounted instruments
  - 4 Main components-
  - (Pump Skid (PDF Page 9),
    - 0501-220 (PDF Page 14) – Rigging – Note 4
  - Cooling Tower (PDF Page 128),
  - Chem Feed Building (PDF Page 13, PDF Page 38),
  - Transformers and Switchboards
    - Switchboards -- PDF Page 264 and 276 – Must move one feeder circuit breaker from Section 2 to Section 3 (do this for both switchboards).
    - Transformers on Starting on PDF Page 288
  - No chillers but you are installing a portion of the piping and valves supplying them.
  - Cable Schedule Other’s Scope (PDF Page 17)
  - One lines -- 501-400 (PDF page 23 as an example, also PDF page 27) – Dashed lines show Contractor Scope
  - PDF Page 299 – Ship Loose Items
GTI Commercial Terms and Conditions

BRIEF SUMMARY OF GTI’S TERMS & CONDITIONS:
• ARTICLE 1 - WORK & SPECIFICATIONS
• ARTICLE 2 - COST AND SCHEDULE
• ARTICLE 3 - REPRESENTATIVES
• ARTICLE 4 - CHANGES AND EXTRAS
• ARTICLE 5 - RESPONSIBILITY FOR WORK; SAFETY OF PERSONS AND PROPERTY
• ARTICLE 6 - PROTECTION OF EXISTING STRUCTURES AND PROPERTY; CONTRACTOR’S LIABILITY.
• ARTICLE 7 - CLEAN UP
• ARTICLE 8 – SUBCONTRACTORS
• ARTICLE 9 – INDEMNIFICATION
• ARTICLE 10 - INSURANCE
• ARTICLE 11 - INDEPENDENT CONTRACTOR
• ARTICLE 12 - STOP WORK ORDER
• ARTICLE 13 - WARRANTY OF CONSTRUCTION
• ARTICLE 14 – TESTING
• ARTICLE 15 – COOPERATION AMONG CONTRACTORS
• ARTICLE 16 - LIENS
Review of Safety and Host Site Requirements
Southwest Research Institute
Program Construction Status

➢ Task 6 – Finishing Construction
  ➢ Mob 5/11/20
  ➢ 5 month schedule
  ➢ Permanent Power Available to the CTS 10/5/20

➢ Task 7B – Bidding
  ➢ Mob mid July

➢ Task 7A – Bidding
  ➢ Mob – late July

➢ Task 8M – Future
  ➢ Mob late summer

➢ Task 8E – Awarded
  ➢ Mob 5/11/20
  ➢ 5 month schedule
  ➢ Permanent Power Available to the CTS 10/5/20
North Side of Building 294 – mid April ‘20
East Side of Building 294 – April ‘20
South Side of Building 294 – April ‘20
Bidder Assumptions

1) Stable Site
2) UG Conduit installed
3) UG Piping installed
4) Foundations poured
5) Gravel installed
6) Roadways are paved
7) No Temporary Chillers
8) Building has CO
Construction Entrance
Working on SwRI Campus

- **Working hours are 6:30am – 6:30pm, Monday through Friday**
  - Work outside these hours must be approved in advance by SwRI Security
  - List of people at least 48 hours in advance
  - Workers must use entrance off West Commerce and stay on job site or entrance road at all times
- **Workers on campus must be authorized to work in the U.S. and carry evidence as such while on campus**
  - Examples of evidence:
    - Driver’s license with gold star in upper right corner
    - Birth, naturalization, or citizenship certificate
    - Passport
    - Permanent resident card
  - Citizens from Syria, Iran, North Korea, Cuba, and Sudan are not allowed on SwRI premises at any time
  - Illegal aliens are not authorized on SwRI premises at any time for any reason
  - Foreign workers must be pre-coordinated 24 hours in advance before being given access
- **Obey traffic laws on campus**
  - Vehicles must be current with registration
- **COVID-19 situation, if still applicable, will require additional reporting**
SwRI Safety & Requirements

Questions for the bidders

➢ What is your company’s RIR for last three years?
➢ Have you had a fatality within the past three years?
➢ What is your corporate approach to Safety?
➢ How would you manage Safety on a daily basis?

Needs for Awarded Contractor

➢ Safety Plan due 30 days before mobilization
➢ Monthly Stats – Near Miss, First Aid, Recordable, Property Damage, Environmental Incident
Crane Operation & Heavy Lifting at SwRI

**Needs for Awarded Contractor**
- Crane checklist & operator qualification
- Rigging design for critical lifts
- Where are you at on the crane chart
- Crane location / Ground bearing pressures
- Roadway protection
Other Considerations for Bidders

Other considerations for bidders

➢ Weekly Contractor coordination meetings
  ➢ In addition to weekly meeting
➢ Contractor to provide portable bathrooms
➢ Contractor to provide water / hydration for workers
➢ Contractor to provide wash stations
➢ Contractor to provide their own office space
➢ Quality Plan required 30 days before mobilization
➢ How much laydown are you requiring?
Site Visits / Questions

- Groups less than 6 persons (total)
- Time Slots
  - Thursday May 21\textsuperscript{st} and Friday May 22\textsuperscript{nd}
  - Thursday May 28\textsuperscript{th} and Friday May 29\textsuperscript{th}
- COVID19 Visitor Form (need at least 1 week prior to visit)
- Provide own PPE / Mask
- Pictures
Cooling System Background – Heat Exchanger Skid
Cooling System Background – Cooling Towers

Cooling tower modules stored at SwRI since November 6, 2019.
Bidder Questions?

Open for questions from potential bidders.

Any Questions?
Follow-Up Actions?

Summary of follow-up actions and next steps.